

CLAIMS

1. A legged mobile robot having a body and legs whose upper ends are connected to the body and whose lower ends are each connected to a foot to be movable when the legs are driven,

5 characterized in that:

the foot comprises:

a foot main body connected to each of the legs;

a toe provided at a fore end of the foot main body to be bendable with respect to the foot main body; and

10 a bending angle holder capable of holding a bending angle of the toe in a bendable range of the toe.

2. The legged mobile robot according to claim 1, further including;

15 a bending angle change suppressor that suppresses change of the bending angle of the toe.

3. The legged mobile robot according to claim 1 or 2, wherein the toe is made continuous with the foot main body and is made of an elastic material that bends with flexing.

4. The legged mobile robot according to claim 1 or 2, wherein the toe is connected to the fore end of the foot main body through a rotational shaft capable of rotating about a pitch axis.

5. The legged mobile robot according to claim 4, further including:

an urging means for urging the toe in a direction of restoring it to an initial position.

5 6. The legged mobile robot according to any of claims 1 to 5, wherein the bending angle holder comprises a friction brake.

10 7. The legged mobile robot according to any of claims 2 to 6, wherein the bending angle change suppressor comprises a damper.

15 8. The legged mobile robot according to any of claims 2 to 5, wherein the bending angle holder and the bending angle change suppressor comprise a friction brake whose frictional force is made adjustable.

20 9. The legged mobile robot according to any of claims 2 to 5, wherein the bending angle holder and the bending angle change suppressor comprise a damper.

25 10. A system for controlling a legged mobile robot having a body and legs whose upper ends are connected to the body and whose lower ends are each connected to a foot to be movable when the legs are driven, the foot having a foot main body connected to each of the legs and a toe provided at a fore end of the foot main body to be bendable with respect to the foot main body,

characterized by:

a bending angle holder capable of holding a bending angle of the toe in a bendable range of the toe; and

a bending angle controlling means for operating the bending angle holder to control holding and releasing of the bending angle of the toe, the bending angle controlling means holding the bending angle of the toe at a first time point which is a liftoff time of the leg from a floor or earlier thereof, and releasing the held bending angle of the toe at a second time point after the leg has lifted off the floor to restore the toe to a initial position.

11. The system according to claim 10, further including:
a gait generating means for generating a gait of the robot;
and the bending angle controlling means determines the first time point and the second time point based on the generated gait.

12. The system according to claim 10, further including;
a bending angle detecting means for detecting the bending angle of the toe;
and
a gait generating means for generating a gait of the robot;
and the bending angle controlling means determines the first time point based on the detected bending angle and determines the second time point based on the generated gait.

13. The system according to claim 10, wherein the bending angle controlling means holds the bending angle of the toe at a third time point during liftoff of the leg from the floor, which is later than the second time point, and releasing the held bending angle of the toe at a fourth time point, after the leg has landed on the floor, which is earlier than the first time point at a next time.

14. The system according to claim 13, further including:
a gait generating means for generating a gait of the robot;
and the bending angle controlling means determines the first to fourth time
points based on the generated gait.

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15. The system according to claim 13, further including;
a bending angle detecting means for detecting the bending angle of the toe;
and
a gait generating means for generating a gait of the robot;
and the bending angle controlling means determines the first and third time
points based on the detected bending angle, and determines the second and fourth time
points based on the generated gait.

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16. The system according to any of claims 10 to 15, further including:
a bending angle change suppressor that suppresses change of the bending
angle of the toe;
and the bending angle controlling means releases the held bending angle of
the toe at the second time point to gradually restore the toe to the initial position by
operating the bending angle change suppressor to reduce the bending angle
progressively.

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17. The system according to any of claims 13 to 15, further including:
a bending angle change suppressor that suppresses change of the bending
angle of the toe;
and the bending angle controlling means operates the bending angle change
suppressor from the fourth time point to the first time point at the next time to control a

floor reaction force acting to the robot through the foot.

18. The system according to any of claims 13 to 15, further including:

5 a bending angle change suppressor that suppresses change of the bending angle of the toe in accordance with a predetermined resistance characteristic set with respect to angular velocity of the bending angle;

 and the bending angle controlling means manipulates a position or posture of the foot from the fourth time point to the first time point at the next time to regulate
10 the bending angular velocity of the toe, thereby varying magnitude of resistance produced by the bending angle change suppressor to control a floor reaction force acting to the robot through the foot.

15 19. The system according to any of claims 13 to 18, further including:

 a bending angle change suppressor that suppresses change of the bending angle of the toe;

 a bending angle detecting means for detecting the bending angle of the toe;
 and

20 a floor shape estimating means for estimating shape of the floor on which the foot is based on at least the detected bending angle;

 and the bending angle controlling means operates the bending angle change suppressor from the fourth time point to the first time point at the next time based on at least the estimated shape of the floor to control a floor reaction force acting to the robot
25 through the foot.